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[Document Name] Specification

[Title of the Invention]

Printing system, Printing Apparatus, Discount Rate Determination Apparatus, and Image Formation Medium Container

[Claim(s)]

[Claim 1] A printing system that comprises a printing mechanism, said printing system comprising:

a writing processing portion that writes information into a storage medium; and

an obtaining portion that obtains information on consumption of an expendable used in maintenance of the printing mechanism,

wherein said writing processing portion writes information, by which total consumption of the expendable is specified, based on the information obtained by said obtaining portion, into the storage medium.

[Claim 2] A printing system in accordance with claim 1, wherein said writing processing portion adds the information obtained by said obtaining portion to the storage medium, by which the total consumption of the expendable is specified.

[Claim 3] A printing system in accordance with claim 1, wherein said writing processing portion updates the storage medium based on the information obtained by said obtaining portion, by which the total consumption of the expendable is specified.

[Claim 4] A printing system in accordance with any one of claims 1 through 3, wherein the storage medium is a storage element which is attached to an image formation medium container, and

said writing processing portion writes the information into the

storage element.

[Claim 5] A printing system in accordance with any one of claims 1 through 4, wherein the expendable is ink.

[Claim 6] A discount rate determination apparatus that determines a discount rate of a product and a service, said discount rate determination apparatus comprising:

a reading portion that reads out information on amount of ink, from a storage medium that stores the information on amount of ink; and

a discount processing portion that executes a discount process to determine a discount rate of the product and the service, based on the information on amount of ink read out by said reading portion.

[Claim 7] A discount rate determination apparatus in accordance with claim 6, said discount rate determination apparatus further comprising:

a writing portion that, after the discount process by said discount processing portion is completed, writes information indicating that the discount process is completed, into the storage medium.

[Claim 8] A discount rate determination apparatus in accordance with either one of claims 6 and 7, wherein the information on amount of ink represents information on either amount of used ink and amount of residual ink.

[Claim 9] A discount rate determination apparatus in accordance with either one of claims 6 and 7, wherein the information on amount of ink represents information on amount of ink used in maintenance.

[Claim 10] A discount rate determination apparatus in accordance with either one of claims 6 and 7, wherein the information on amount of ink represents information on amount of ink used in ordinary printing,

and

said discount processing portion specifies amount of ink not used, from the information on amount of ink used in ordinary printing, to execute the discount process based on the amount of ink not used.

[Claim 11] A sales management system that comprises a discount rate determination apparatus in accordance with claim 6, said sales management system further comprising:

a reception portion that receives a price of a product and a service to offer; and

a discounted price determination processing portion that determines a discounted price, based on the price received by said reception portion and a discount rate determined by said discount processing portion in said discount rate determination apparatus.

[Claim 12] An image formation medium container that is attachable to a printing apparatus and has a storage element,

wherein said storage element has an area for storing information on amount of ink used in maintenance of said printing apparatus.

[Claim 13] An image formation medium container in accordance with claim 12, said image formation medium container is an ink cartridge that contains ink.

[Claim 14] A printing apparatus that comprises a printing mechanism, said printing apparatus comprising:

a writing processing portion that writes information into a storage medium which has a storage area for storing information on consumption of an expendable; and

an obtaining portion that obtains information on a consumption of an expendable used in maintenance of the printing mechanism,

wherein said writing processing portion writes information, by which a total consumption of the expendable is specified, based on the information obtained by said obtaining portion, into the storage area of the storage medium.

[Claim 15] A printing system that comprises a printing mechanism, said printing system comprising:

an obtaining portion that obtains information on consumption of an expendable used in maintenance of the printing mechanism; and

a writing processing portion that writes the information on consumption of an expendable, which is obtained by said obtaining portion, into a storage medium.

[Claim 16] A printing apparatus that comprises a printing mechanism, said printing apparatus comprising:

an obtaining portion that obtains information on consumption of an expendable used in maintenance of the printing mechanism; and

a writing processing portion that writes the information on a consumption of an expendable, which is obtained by said obtaining portion, into a storage medium which has a storage area for storing the information.

[Detailed Description of the Invention]

[0001]

[The Technical Field]

The present invention relates to a technique to manage a consumption of an expendable in a printing device, and to make a refund to a user according to the used amount of the expendable.

[0002]

[Description of the Prior Art]

For ink jet printers capable of color printing, an ink cartridge comprising a plurality of bottles integrated with one another is sometimes used for housing inks of a plurality of colors. In ink cartridges of this type, when the ink of at least one of the colors runs out, color printing cannot be carried out even if the inks of the other colors remain.

[0003]

Moreover, printers require occasional maintenance. For example, in the case of ink jet printers, when the nozzle is clogged, the print head is cleaned. This cleaning consumes ink in the ink cartridge.

[0004]

Users who purchase ink cartridges want to carry out printing with the least wasted ink. Therefore, users are greatly dissatisfied with the ink that remains unused or the ink consumed for maintenance as mentioned above.

[0005]

Under such circumstances, if a refund can be made to users who purchased ink cartridges according to the amounts that cannot be used for printing, user dissatisfaction will be resolved, which will improve customer satisfaction.

[0006]

The object of the present invention is to provide a technique to make a refund to a user according to the amount of ink that cannot be used for printing.

[0007]

[Means for solving the Problem]

In order to achieve the above object, the present invention is constructed as follows. The invention is designed to obtain information on amount of an expendable used in maintenance of a printing mechanism, and to write information, by which a total consumption of the expendable is specified, into a storage medium which has an area for storing the information, based on the obtained information.

[0008]

The invention is also designed to read out information on amount of ink, which is stored in a storage medium, and to determine a discount rate of a product or a service, based on the read out information on the amount of ink.

[0009]

[Embodiment of the Invention]

One embodiment of the present invention is described below with reference to the accompanied drawings.

[0010]

A printing system of the present embodiment includes, as shown in FIG. 1, a host computer (hereinafter, referred to as "host") 1 and a printer 6 which is a printing apparatus that prints out print data output from the host 1.

[0011]

The host 1 is provided with a host main unit 11, a display 12 and a keyboard 13. The host main unit 11 has: a CPU 20 executing various programs; a ROM 21 storing various data and programs; a RAM 22 temporarily storing various data and programs; a display controller 23 controlling the display 12; a keyboard controller 24 controlling the keyboard 13; a floppy disk drive 25; a hard disk drive 26; a CD-ROM drive 27; a

printer interface 28; and a net interface 29.

[0012]

The printer 6 is, for example, an ink jet printer capable of color printing, and when receiving print data from the host 1, executes a predetermined printing process to form an image on a print sheet which is a print medium. The printer 6 has a printing mechanism 68 actually carrying out printing, and a printing control portion 61 controlling these. The printing control portion 61 has: a CPU 62 executing various programs; an EEPROM 63 storing various data and programs; a RAM 64 temporarily storing various data and programs; interfaces 65 and 66 exchanging data with the host 1 or the printing mechanism 68; and the printing mechanism 68. The printing mechanism 68 has a storage element 90 (the recording medium of the present invention). Preferably, the storage element 90 is attached to a case containing an image formation medium such as ink or toner and being detachably attachable to the printing mechanism 68. More preferably, the storage element 90 comprises a semiconductor memory such as an IC (integrated circuit).

[0013]

Next, an example of the case containing the image formation medium and to which the storage element 90 is attached will be described with reference to FIG. 2.

[0014]

FIG. 2 shows the appearance of an ink cartridge 80 to which the storage element 90 is attached. The ink cartridge 80 is provided with a cartridge main body 81 constituting an ink container containing ink inside, and the storage element 90 incorporated in a side frame portion

82 of the cartridge main body 81. In the storage element 90, ink cartridge identification information and information on the ink amount are stored.

[0015]

The storage element 90 exchanges various data with the printing control portion 61 by being connected to the interface 65 of the printing control portion 61 when the ink cartridge 80 is attached to a non-illustrated cartridge attached portion of the printing mechanism 68 of the printer 6. "Connection" mentioned here may be either with contact or without contact. Therefore, although a contact-type storage element is used in the description given below, a non-contact-type storage element may be used. Since the storage element 90 is attached to a concave portion 83, being opened at the bottom, of the side frame portion 82 of the ink cartridge 80, only a plurality of connection terminals 84 is exposed. While an ink cartridge is described here, the cartridge may be a toner cartridge having inside a toner container for containing toner inside.

[0016]

Next, the internal functions of the host 1 and the printer 6 will be described. FIG. 3 is a functional structure view of the host 1 and the printer 6. The host main unit 11 is provided with applications 40, a communications control portion 45 and a printer driver 50. These functions are each realized by the CPU 20 executing a predetermined program.

[0017]

The communications control portion 45 controls communications with the printer 6. For example, the communications control portion 45 outputs printing requests including print data and maintenance

instructions to the printer 6.

[0018]

The printer driver 50 has as functions thereof a printing managing portion 51, a maintenance control portion 52 and a display control portion 53.

[0019]

The printing managing portion 51 receives printing instructions from the applications 40 or the keyboard 13, and generates print data based thereon. The generated print data is passed to the communications control portion 45.

[0020]

The maintenance control portion 52 controls the printer 6 when the printer 6 carries out various kinds of maintenance. For example, the maintenance control portion 52 controls cleaning of the print head. FIG. 4 (a) schematically shows the cleaning mechanism of the print head of the printer 6.

[0021]

Ink is supplied from the ink cartridge 80 attached to the printing mechanism 68 through a pipe 31 to a print head 32. A nozzle surface 32a of the print head 32 is shown in FIG. 4 (b). On the nozzle surface 32a, nozzles 39a, 39b, 39c and 39d for spraying inks of C (cyan), M (magenta), Y (yellow) and K (black), respectively, are arranged. When normal printing is carried out, ink is sprayed from the nozzles 39a, 39b, 39c and 39d. When head cleaning is carried out, the opened part of a box-shaped cap 33 is attached to the nozzle surface 32a. The part 33a where the opened part of the cap 33 abuts on the nozzle surface 32a when the print head 32 is attached is as shown in FIG. 4 (b). At

this time, the nozzles 39a, 39b, 39c and 39d of all of the colors C, M, Y and K are covered with the cap 33. The space in the cap 33 communicates with a pump 34 through a pipe 35. The pump 34 is connected to a waste liquid absorber 37 through a pipe 36.

[0022]

When head cleaning is carried out, the pump 34 forcibly sucks ink from the nozzle 39. At this time, inks of all of the colors C, M, Y and K are absorbed. The sucked ink is dropped into the cap 33 and absorbed by the waste liquid absorber 37 through the pipes 35 and 36. Consequently, clogging of the head is resolved, so that so-called character omission never occurs.

[0023]

This head cleaning includes the following cases: a case where cleaning is carried out in response to an instruction from the user issued on a utility selection screen 100 described next (hereinafter, referred to as maintenance 1); a case where cleaning is carried out, when printing is not carried out for a predetermined period of time (for example, two weeks) or longer, in the initial processing carried out when the power is turned on (hereinafter, referred to as maintenance 2); and a case where cleaning is carried out when the ink cartridge is replaced (hereinafter, referred to as maintenance 3).

[0024]

The display control portion 53 displays user interface screens and the like on the display 12. For example, the display control portion 53 displays the utility selection screen 100 shown in FIG. 5. By using the screen 100, head cleaning can be carried out at a given point of time desired by the user.

[0025]

The utility selection screen 100 is a screen accepting the user's selection of a utility function. The utility selection screen 100 has buttons 110, 120, 130 and 140 accepting selections of printer condition monitoring, head cleaning, clogging pattern printing and gap adjustment, respectively. When the head cleaning button 120 is depressed, the above-described cleaning of the print head of the printer is carried out

[0026]

The printing control portion 61 has as internal functions thereof a communications control portion 71, a printing mechanism control portion 72, an ink information obtaining portion 73 and a storage element managing portion 74. These functions are each realized by the CPU 62 executing a predetermined program.

[0027]

The communications control portion 71 controls communications with the host 1. For example, the communications control portion 71 accepts print data and maintenance instructions from the host 1.

[0028]

The printing mechanism control portion 72 accepts printing requests from the host 1 and passes the print data to the printing control portion 61 to carry out printing.

[0029]

The ink information obtaining portion 73 obtains information representative of the amount of ink used for normal printing or the amount of ink consumed when maintenance is carried out. For example, the ink information obtaining portion 73 measures the amount of ink

consumed when printing is carried out. Specifically, the ink information obtaining portion 73 counts the number of dots of sprayed ink to thereby estimate the ink amount. The ink information obtaining portion 73 also counts the number of times of dummy ink spraying called flushing, and estimates the amount of the consumed ink. Flushing is to spray ink to an absorber disposed outside a printing range at regular time intervals to prevent ink in the vicinity of the exit of the nozzle from being dried when the cap is opened (hereinafter, referred to as maintenance 4).

[0030]

The amount of ink consumed when each of the maintenance 1, the maintenance 2 and the maintenance 3 is carried out once is almost the same among the same models of printers 6. Each printer 6 stores the numerical values in a non-illustrated storage portion. The ink information obtaining portion 73 estimates the consumption amount of ink every time each of the maintenance 1, the maintenance 2 and the maintenance 3 is carried out.

[0031]

In addition to the above-described method indirectly estimating the consumption amount of ink, information representative of the ink amount may be obtained by attaching a sensor and directly measuring the consumption amount of ink or the residual amount of ink.

[0032]

The storage element managing portion 74 carries out reading or writing of information stored in a storage area of the storage element 90 when the ink cartridge 80 is attached to the printing mechanism 68 of the printer 6. For example, the storage element managing portion

74 writes predetermined information into the storage element 90 based on the information representative of the ink amount obtained by the ink information obtaining portion 73. The predetermined information is information for the total consumption amount of ink of the ink cartridge 80 to be shown. Specifically, for example, it may be carried out to calculate the total consumption amount based on the information representative of the ink amount and update the storage contents of ink amount information 900 (update type). Alternatively, it may be carried out to add the information representative of the ink amount to the ink amount information 900 so that the total consumption amount is found when the information is read out (addition type).

[0033]

When a request to read out the ink amount information 900 is accepted, the ink amount information 900 stored in the storage element 90 is read out.

[0034]

Data items of the ink amount information 900 are shown in FIG. 6. The ink amount information 900 has as data items thereof an amount 910 of the ink consumed when the maintenance 1 is carried out, an amount 920 of the ink consumed when the maintenance 2 is carried out, an amount 930 of the ink consumed when the maintenance 3 is carried out, the number 940 of the dots sprayed when the maintenance 4 is carried out, and the number 950 of the dots sprayed when normal printing is carried out. Areas for storing the consumption amounts 910, 920 and 930 and the dot numbers 940 and 950 are provided for each of C, M, Y and K. The items may be either the update type or the addition type.

[0035]

While the consumption amount of ink is stored for the maintenance 1, the maintenance 2 and the maintenance 3 in the present invention, the number of times the maintenance is carried out may be stored. In that case, when the number of times of execution is read out from the ink amount information 900, a processing to convert it to the consumption amount is carried out as required. Moreover, while the number of sprayed dots is stored in the cases of the maintenance 4 and normal printing, it may be carried out to convert the number of dots to the consumption amount of ink and store the consumption amount of ink.

[0036]

By the present embodiment, the amount of ink consumed for printing and the amount of ink consumed for maintenance can be stored in the storage element 90 provided in the ink cartridge 80.

[0037]

Next, a second embodiment to which the present invention is applied will be described.

[0038]

In some color ink cartridges, when the ink of at least one of a plurality of colors runs out, printing cannot be carried out even if the inks of the other colors remain. This dissatisfies users. Moreover, ink is consumed when maintenance of the print head is carried out. Bearing of the costs of ink consumed for maintenance also dissatisfies users.

[0039]

The present embodiment provides a sales managing apparatus 200 for resolving such user dissatisfaction. The present embodiment uses the ink cartridge 80 provided with the storage element 90 in which

the ink amount information 900 is written in the first embodiment described above.

[0040]

The present embodiment is provided with a sales managing apparatus 200 as shown in FIG. 7. The sales managing apparatus 200 is provided with an information processor main unit 210, a display 12 and a keyboard 13. The information processor main unit 210 has a CPU 20, a ROM 21, a RAM 22, a display controller 23, a keyboard controller 24, a floppy disk drive 25, a hard disk drive 26, a CD-ROM drive 27, and an interface 211 for connection with the storage element 90.

[0041]

Further, the sales managing apparatus 200 is provided with a non-illustrated mechanism for attaching the ink cartridge 80. When the ink cartridge 80 is attached to the attachment mechanism, the storage element 90 is connected to the interface 211.

[0042]

The functional structure view of the sales managing apparatus 200 is shown in FIG. 8. The sales managing apparatus 200 has as internal functions thereof a storage element input/output portion 221, a product price accepting portion 222, a discount processing portion 223, a discounted price deciding portion 224 and a display control portion 225. These functions are each realized by the CPU 20 executing a predetermined program.

[0043]

The storage element input/output portion 221 reads out the ink amount information 900 stored in the storage element 90. Moreover, when a discount processing by the discount processing portion 223 is

carried out, the storage element input/output portion 221 writes into the storage element 90 information representing that the discount processing has been completed.

【0044】

The product price accepting portion 222 accepts the price of the product to be sold or the service to be provided. For example, the product price accepting portion 222 accepts the price of a product or the like entered with the keyboard 13.

【0045】

The discount processing portion 223 carries out a discount processing for a product or a service. For example, the discount processing portion 223 carries out a discount processing based on the ink amount information 900 read out by the storage element input/output portion 221. Specifically, when the ink of one color runs out in a color ink cartridge, based on the ink amount information 900, the discount processing portion 223 estimates the residual amounts of the inks of the other colors or the amount of the unused ink that cannot be used for printing. The amount of the unused ink may be estimated, for example, by counting backward from the number of times of ink spraying in normal printing. The residual amounts of ink may be estimated by counting backward from the sum total of the amount of ink used for normal printing and the amount of ink used for maintenance. Further, the discount amount may be decided by combining the residual amounts of ink and the amount consumed for maintenance. Cash corresponding to the discount amount may be returned, or points corresponding to the discount amount may be issued so that the user can use them when the user makes next and succeeding purchases.

[0046]

The discounted price deciding portion 224 decides the discounted price based on the price of the product to be sold or the service to be provided and which price is accepted by the product price accepting portion 222, and the discount amount decided by the discount processing portion 223. For example, the discounted price is obtained by subtracting the discount amount from the price of the product or the like.

[0047]

The display control portion 225 displays the result of the processing by the discount processing portion 223 or the discounted price deciding portion 224 on the display 12. For example, the display control portion 225 displays discount display screens 300 and 310 shown in FIG. 9(a) and FIG. 9(b) on the display 12. The discount display screen 300 shown in FIG. 9(a) is provided with an area 301 for displaying the residual amount of ink and an area 302 for displaying the discount amount corresponding thereto. The discount display screen 310 shown in FIG. 9(b) is provided with an area 311 for displaying the amount used for maintenance, and an area 312 for displaying the discount amount corresponding thereto.

[0048]

The embodiment makes a refund to a user according to the amount of ink that cannot be used for printing, by means of an ink cartridge purchased by the user.

[0049]

The sales managing apparatus 200 described in the second embodiment can also be realized by a combination of the host 1 and

the printer 6 described in the first embodiment.

[0050]

Moreover, in the present embodiment, the product price accepting portion 222 and the discounted price deciding portion 224 can be omitted. When these are omitted, the sales managing apparatus 200 is provided with only a function to decide the discount amount.

[0051]

In addition thereto, for the elements described in the first and the second embodiments, changes in combination, addition and omission can be made as much as possible.

[0052]

[Effect of the invention]

The present invention enables a refund to a user according to the amount of ink that cannot be used for printing.

[Brief Description of the Drawing(s)]

[Fig. 1] Fig. 1 shows a structure view of a hardware of a printing system in a first embodiment of the present invention.

[Fig. 2] Fig. 2 shows appearance of an ink cartridge used in a printer in the first embodiment.

[Fig. 3] Fig. 3 shows a functional structure view of the printing system in the first embodiment

[Fig. 4] Fig. 4 (a) schematically shows a head cleaning mechanism, and Fig. 4 (b) shows a nozzle surface of a print head in the first embodiment.

[Fig. 5] Fig. 5 shows one example of a utility selection screen in the first embodiment.

[Fig. 6] Fig. 6 shows data items of ink amount information in the first embodiment.

[Fig. 7] Fig. 7 shows a structure view of a hardware of a printing system in a second embodiment of the present invention.

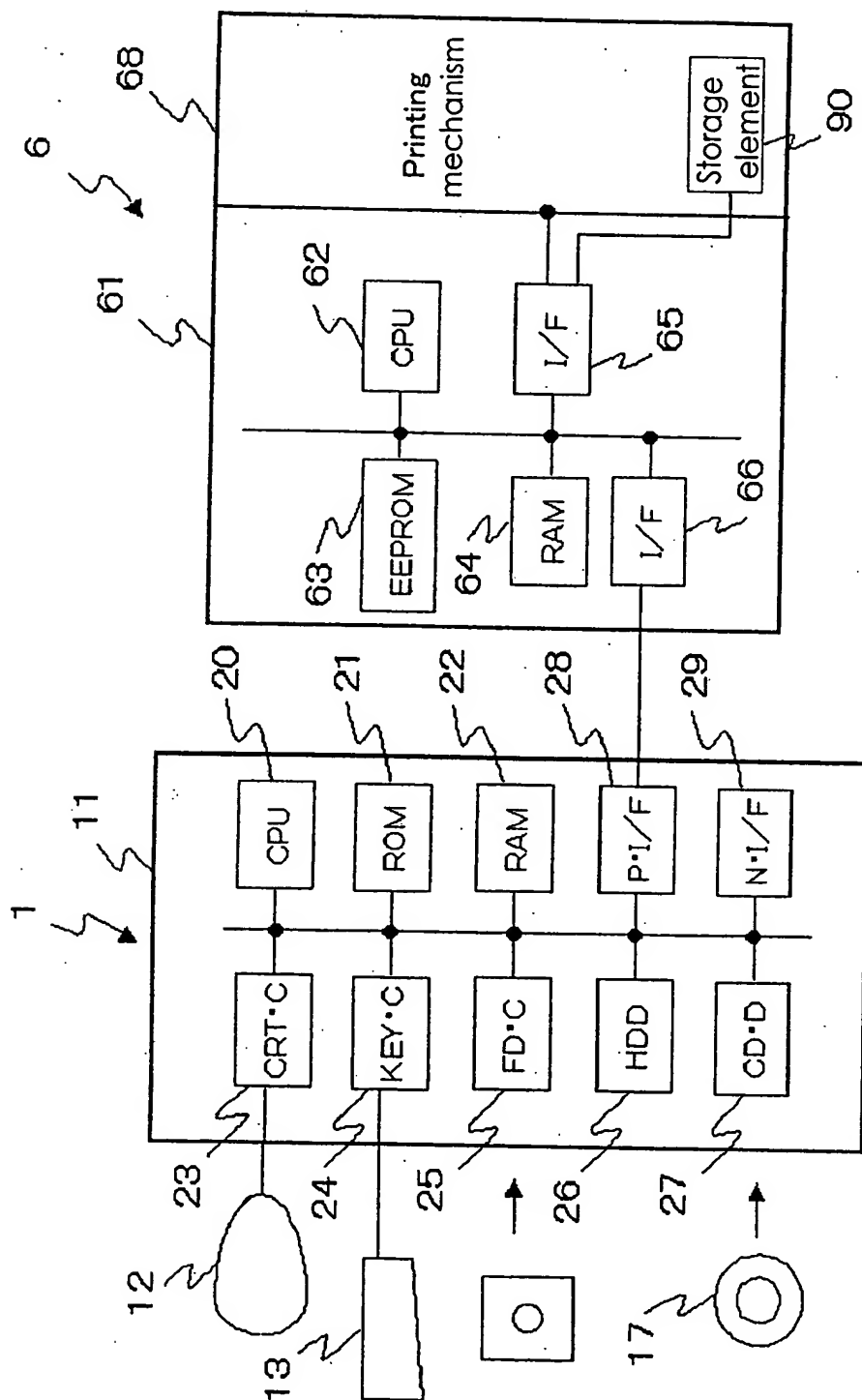
[Fig. 8] Fig. 8 shows a functional structure view of a sales managing apparatus in the second embodiment.

[Fig. 9] Fig. 9 shows one example of discount display screens in the second embodiment.

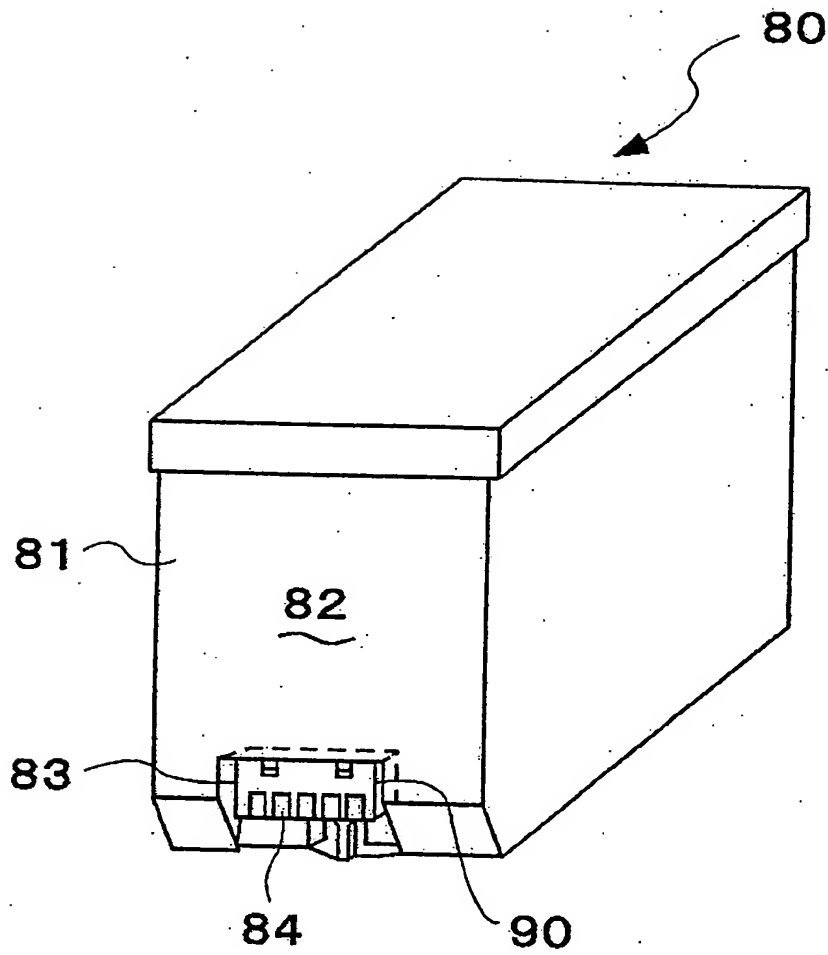
[Description of Notations]

1:a host computer, 6:a printer, 11:a host main unit, 61:a printing control portion, 68:a printing mechanism, 50:a printer driver, 72:a printing mechanism control portion, 73:an ink information obtaining portion, 74:a storage element managing portion, 80:an ink cartridge, 90:a storage element, 200: a sales managing apparatus, 221:a storage element input/output portion, 222: a product price accepting portion, 223:a discount processing portion, 224:a discounted price deciding portion, 225:a display control portion

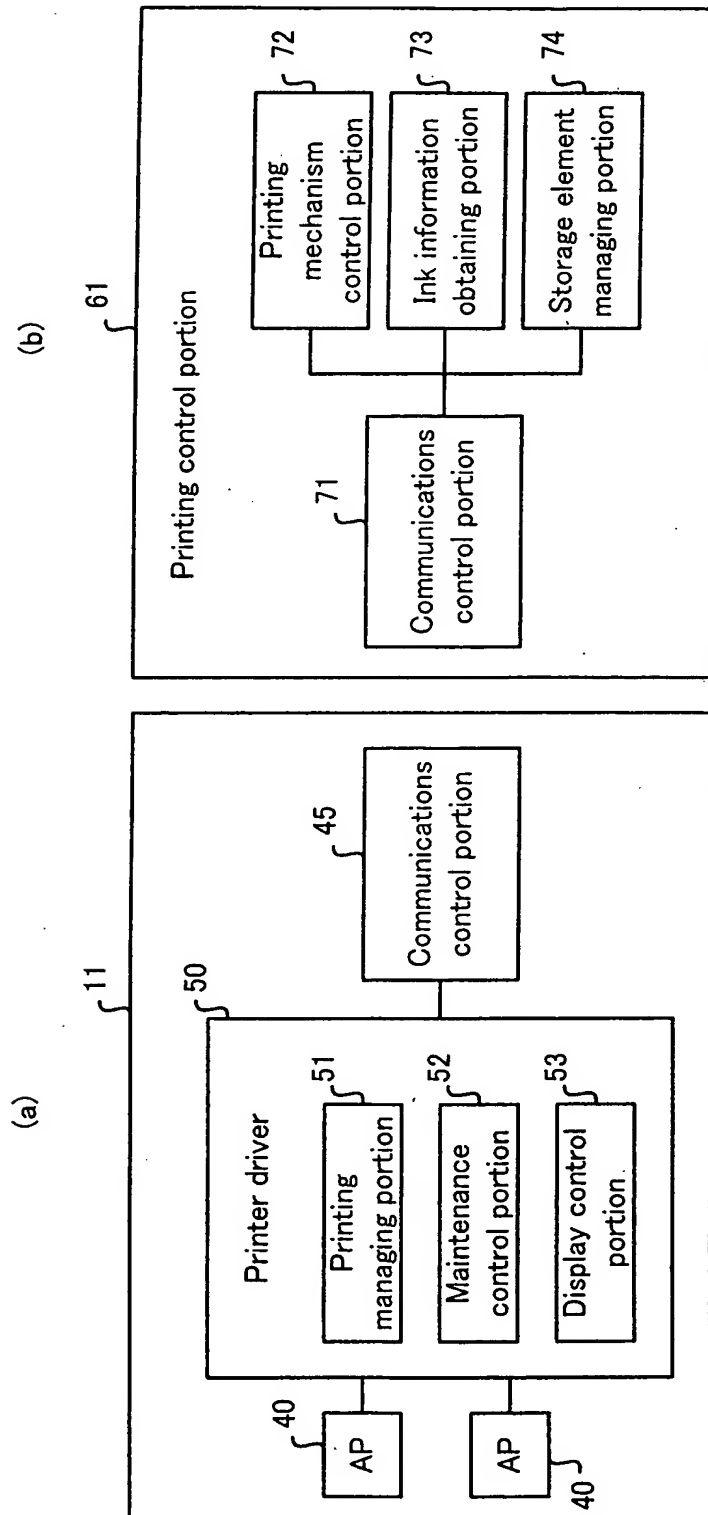
[Document Name] Drawins(s)
 [Fig.1]



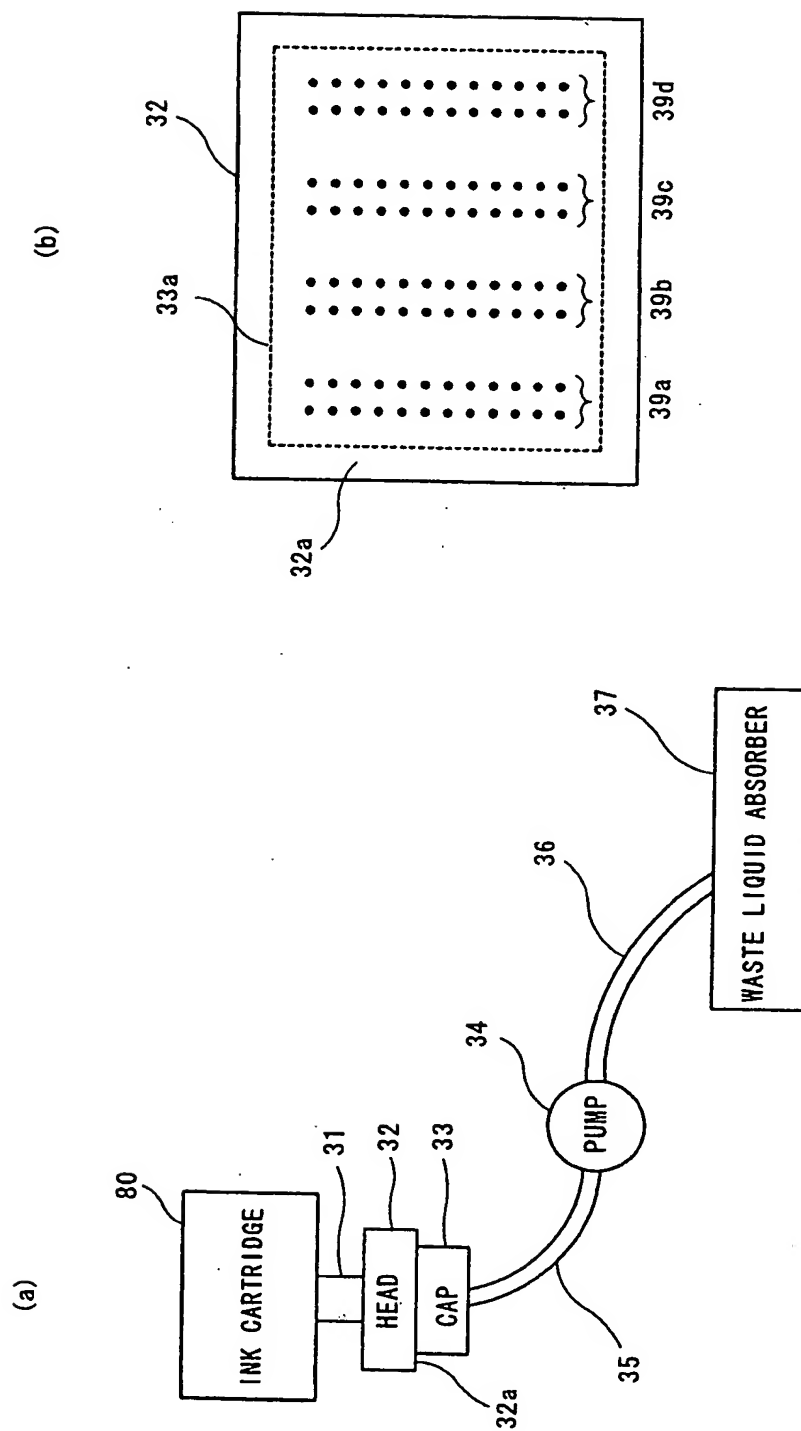
[Fig. 2]



[Fig.3]

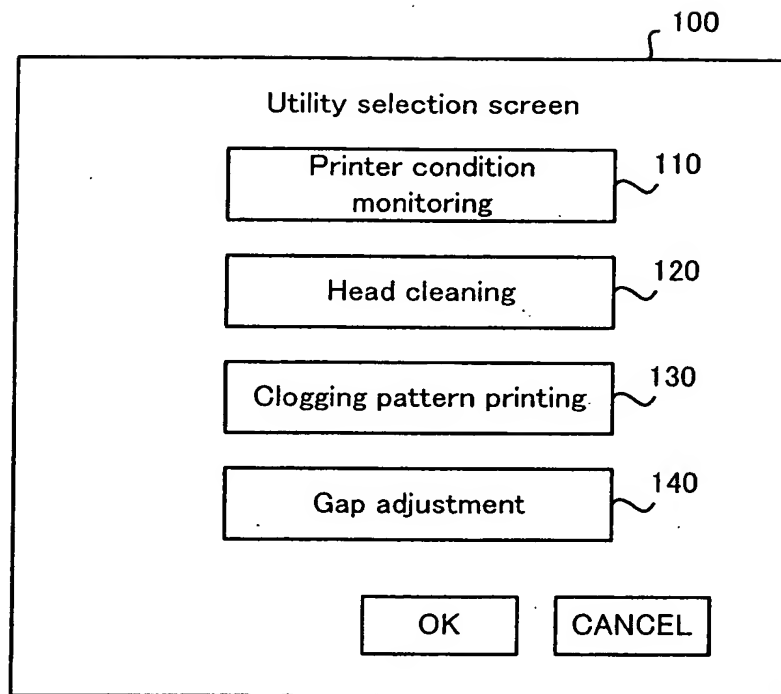


[Fig. 4]



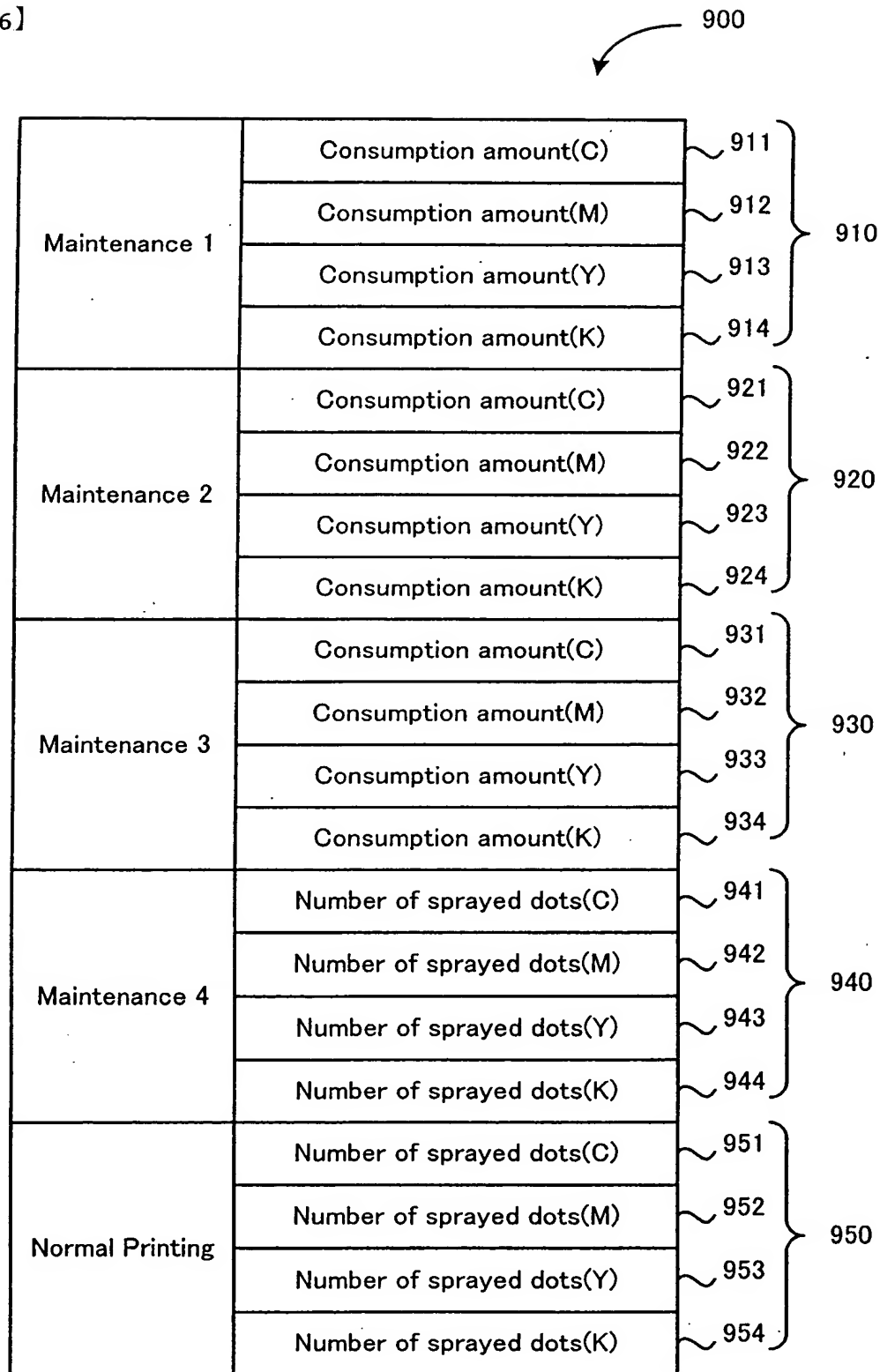


[Fig. 5]



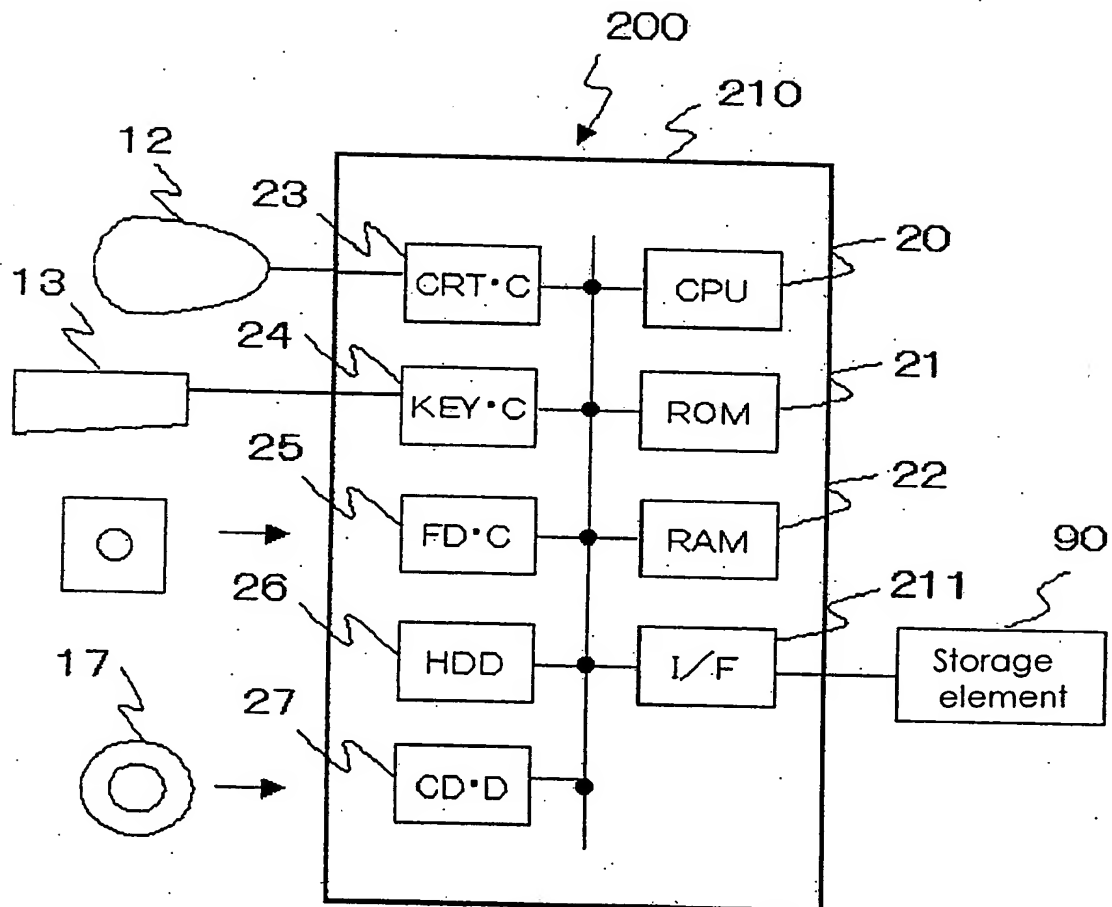


[Fig. 6]



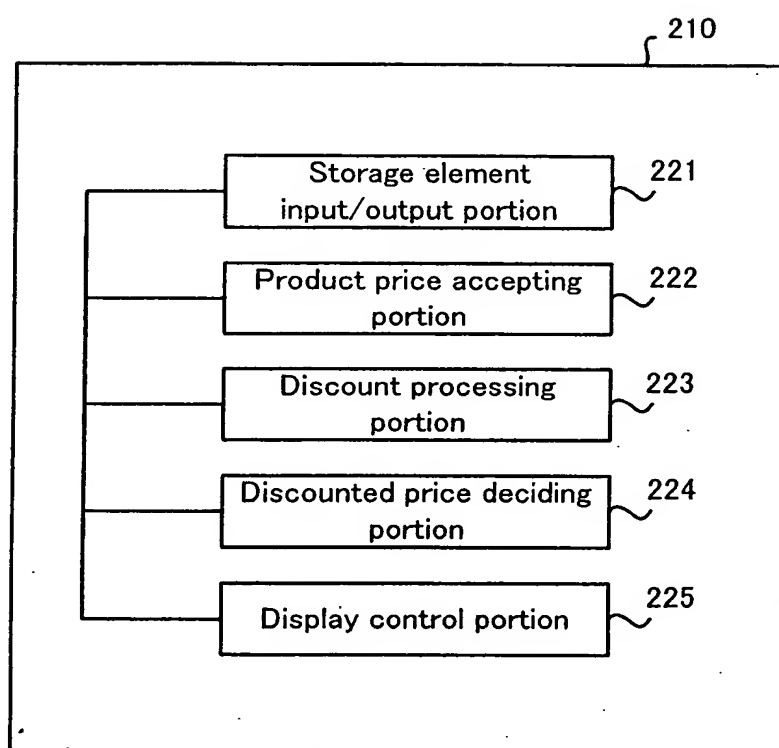


[Fig.7]

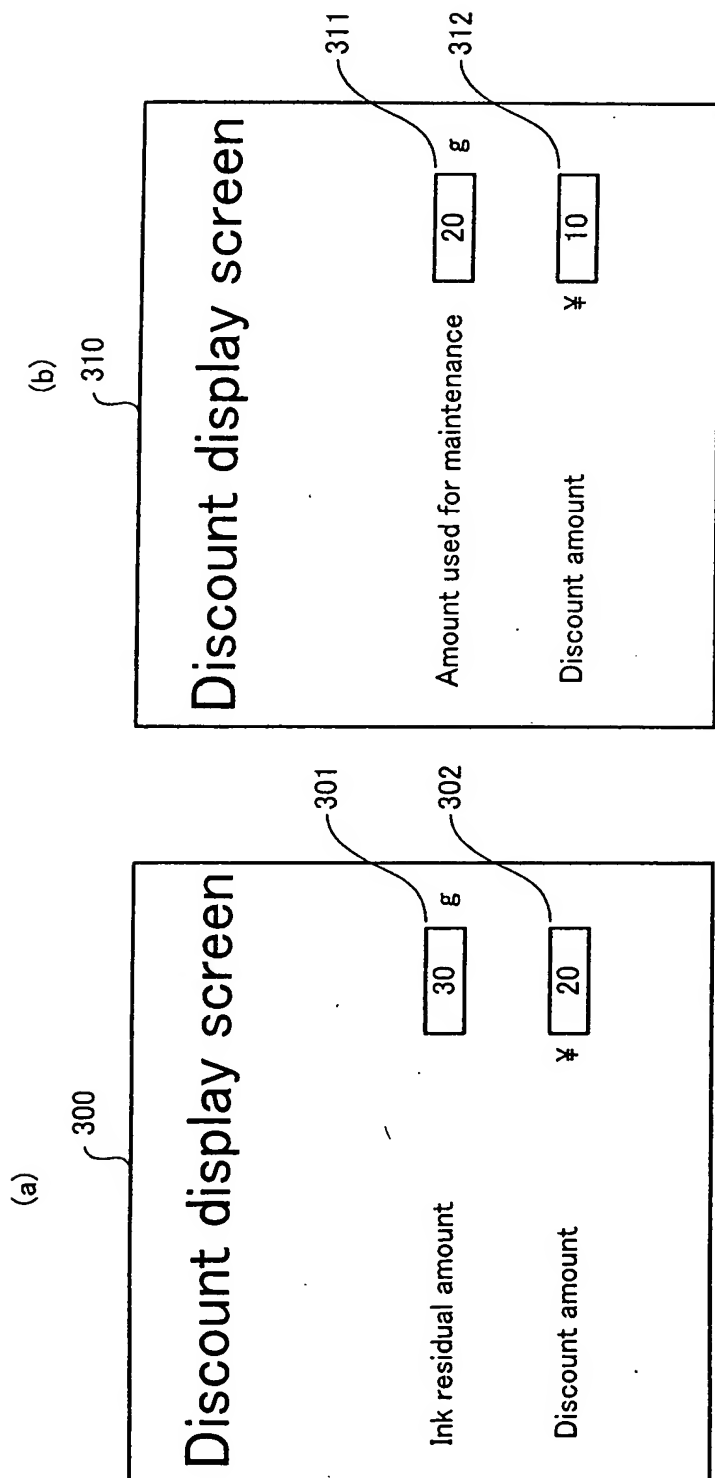




[Fig.8]



[Fig. 9]





[Document Name] Abstract

[Abstract]

[Problem to be Solved]

The present invention aims to provide a system that stores amount of ink consumed in maintenance into a storage element of an ink cartridge.

[Solution]

When a printer carries out maintenance by control by a maintenance control portion 52, an ink information obtaining portion 73 calculates the amount of the consumed ink. The calculated ink amount is stored in a storage element attached to an ink cartridge by a storage element managing portion 74.